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Education, general

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Norman, Oklahoma

1967

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

COMPETENCIES OF THE EDUCATIONAL RESEARCHER

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1966

COMPETENCIES OF THE EDUCATIONAL RESEARCHER

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ACKNOWLEDGMENTS

The author would like to acknowledge the assistance of Dr. Charles M. Bridges, Jr., whose statistical and organizational assistance in many dissertations in the College of Education goes without any mention whatsoever. The assistance and instruction of the rest of the committee, Professors Angelino, Brixey, and Cella, was also appreciated.

Appreciation is also expressed to Dr. Louis L. McQuitty in the giving of his permission to use his linkage analysis method in the analysis of the data in this study.

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COMPETENCIES OF THE EDUCATIONAL RESEARCHER

CHAPTER I

INTRODUCTION

If the catalogs of various universities and colleges were examined and a list compiled of the courses required for a specific degree, there would be varying degrees of concurrence. This may be expected since different institutions have different requirements for their various degrees. The various institutions may have the same objectives concerning the various degrees but these objectives are defined in different manners.

This same type of problem exists in the field of educational research. An objective that the educational researcher has before him is to do "good" research, yet each researcher may define "good research" in a different manner. It is usually assumed that some intuitive knowledge of good research techniques is present with everyone doing research. Studies quoted later from the literature tend to indicate that this assumption is not always valid.

One way to attack the problem is to decide, in some manner, what competencies are necessary in order to do

"good" research. This procedure assumes that if the competencies are applied appropriately, "good" research then may result. Such a competency pattern set has not been defined for educational researchers.

Purpose of the Study

This study proposes a set of competencies which may be necessary in order to do educational research in the various educational fields.

Statement of the Problem

In order to accomplish the stated purpose of this study certain problematic questions arose:

1. Were there basic competencies that all educational researchers should possess?
2. Were there competencies which educational researchers should possess unique to their respective fields of research endeavor?

Need and Importance of Study

In 1960 a study conducted by the American Association of Colleges for Teacher Education (AACTE) recommended comprehensive analyses of the programs that were preparing graduates requiring professional competencies.¹ One of the needs that such analyses should fulfill would

¹Am. Assn. of Colleges for Teacher Education, The Doctorate in Education: An Inquiry into Conditions Affecting Pursuit of the Doctoral Degree in the Field of Education (3 volumes; Washington, D.C.: AACTE, 1960).

be to know which competencies will be needed for the various individual professional fields.

A study by Sieber devoted to the analysis of courses offered in educational research developed the conclusion that since methods courses were scattered in various departments it was difficult to obtain the competencies that a particular institution may require for a degree in educational research. Of particular significance in this study is the statement that because of this dispersion "it certainly does not signify that a coordinated program for training in research is a common occurrence."² This lack of coordination, in addition to producing obvious drawbacks, may be the result of not knowing what competencies are important to educational researchers in the specific fields. Course work seemingly is not the method for defining competencies. It would be useful to know what competencies are needed before trying to develop them in some haphazard course work arrangement.

In investigating research in the various fields, the following writers made various comments concerning research.

Selvin in his "Teaching of Methodology" asked that graduate students become more competent in research and in research-methodology courses. He suggested that one

²Sam D. Sieber, Course Offerings in Educational Research (New York: Bureau of Applied Social Research, Columbia University, 1964), p. 9. (Mimeographed.)

competency to improve is the mathematical knowledge of graduate students.³

Nash made certain vigorous criticisms of much research in the area of educational history.⁴ He has noted that much research concerning the history of education was trivial because it had attempted to copy the natural sciences and obtain precise, measurable results when this should not have been the goal of such research.

Carroll commented that many researchers concerned with research related to the teaching of foreign language did not consider many classroom procedures (or they were ignorant of actual teaching methods!), and sometimes produce experiments that "have an almost complete lack of relevance to language teaching".⁵ He noted that the researchers in foreign language need to develop competence in experimental rigor instead of announcing a study as an "experiment" when it actually is nothing but a report of new teaching procedures or contains "completely inadequate" controls.⁶

³Hanan C. Selvin, "The Teaching of Methodology," Paper prepared for the International Round Table on the Teaching of Sociology in Institutions of Higher Education, September, 1962, p. 7. (Mimeographed.)

⁴Paul Nash, "The Future of Educational Research in Canada: A Critique," Canadian Education and Research Digest, II (September, 1962), p. 164.

⁵John B. Carroll, "Research on Teaching Foreign Language," Handbook of Research on Teaching, ed. N.C. Gage (Chicago: Rand McNally and Company, 1963), p. 1065.

⁶Ibid., p. 1066.

Numerous other suggestions concerning research in foreign language education were also given by Carroll.

Concerning research on the teaching of science, Watson has noted that a scarcity of research in this area exists.⁷ However, he reviewed the research available to him and noted how the research could have been improved (p. 1033ff). His remarks were very relevant to the types of studies described and served to stress the fact that certain competencies needed by the researchers were missing or very underdeveloped.

Henderson suggested that mathematics research can be improved by reducing "semantic confusion".⁸ After reviewing a considerable amount of research in mathematics education, he suggested that the use of modern logic symbolization will generate theory that is "more productive of questions worth asking - questions to which research may produce answers in the form of statements universally quantified over a certain well-defined domain".⁹ This was an interesting competency that may be of some use for the mathematics researcher to develop.

Travers gave criticisms of fifty recent studies in educational research. Two criticisms given were that the

⁷Fletcher G. Watson, "Research on Teaching Foreign Languages," Handbook of Research on Teaching, ed. N. C. Gage (Chicago: Rand McNally and Company, 1963), p. 1065.

⁸Kenneth B. Henderson, ibid., p. 1026.

⁹Ibid., p. 1026.

major purpose of past research seemed not to "discover" but to justify a particular program and that the studies did not attempt to build on work previously undertaken.¹⁰

Referring to educational researchers in psychology, Belanger inferred that a competency badly in need of development for the research in his field was the ability to choose "methodology to cope with the multivariate nature of educational phenomena".¹¹ He noted that in this field there is considerable movement away from simple bivariate models and toward the use of multivariate statistics.

In the February, 1964 issue of the Review of Educational Research, Elam and Garvus reported that in 1962 forty state educational associations possessed some type of organized research effort.¹² It is quite possible that by now this number has increased. Many organizations closely associated with teaching have research departments or research bureaus. Some of these include: The American Federation of Teachers Department of Research, the American Educational Research Association, Phi Delta Kappa

¹⁰Robert M.W. Travers, "A Study of the Relationship of Psychological Research to Educational Practice," Training Research and Education, ed. Robert Glaser (Pittsburgh: Univ. of Pittsburgh Press, 1962), chap. 17, pp. 525-558.

¹¹Maurice Belanger, "Methodology of Educational Research in Science and Mathematics," Review of Educational Research, III, No. 3, (June, 1964), p. 385.

¹²Stanley Elam and Robert Garvue, "Professional Organizations and Education," Review of Educational Research, XXXIV, No. 1, (February, 1964), p. 105.

International, and the research departments of the National Education Association, universities, and colleges across the United States. To name every organization that possesses a research department would probably require a book many times the size of this study. Each of these support researchers.

The review of the literature illustrates two points:

1. Many researchers were not satisfied with the quality of some educational research being done.
2. Various educational organizations need researchers to perform research. The question to be answered is what basic preparation should be needed for the preparation of these educational researchers?

From this last question arises the study being proposed. Basic to this question is one that should be answered: What competencies should an educational researcher possess and thereby possibly improve the research being done? When these competencies are identified an appropriate program of studies may be developed which in turn works toward the development of these competencies.

Should the professional preparation of an educational researcher consist of certain courses? If so, what should these courses be? Should the researcher show competencies in one field or varied fields? These questions indicate, along with writers previously referred to, that a need exists to discover the competencies necessary to do

educational research. These research competencies possibly are entirely different from those proposed by these various writers.

Design of the Study

In answer to the question, "Who is the educational researcher?", Phi Delta Kappa has published the National Register of Educational Researchers. This publication was co-sponsored by Phi Delta Kappa and the Bureau of Educational Research and Service at Ohio State University.

The individuals were identified for inclusion in the Register through the following sources:

1. Professional directories--e.g., American Educational Research Association Directory, American Psychological Association Directory, etc.
2. Professional journals--e.g., Review of Educational Research, Psychological Abstracts, Sociological Abstracts, etc.
3. The Bio-Sciences Information Exchange.
4. Reports of Cooperative Research Projects, and Title III Higher Education Projects.
5. Current Sociological Research.
6. Directors of state departments of education, state educational associations, divisions of research in public schools, etc.

The criteria for selection for inclusion in the Register limited the list to only those who were involved

in educational research or whose work was oriented in the direction of educational research.

Concerning the researchers included in it, the Register states, "There is little doubt that the majority of leading researchers in the field have been included... It therefore appears safe to assume that the analysis group is large enough to be adequately representative of the educational researcher population."¹³

Robert Bargar has written concerning the Register: "...it is not a directory of any professional organization, nor is it an attempt to identify any 'special' group in which 'membership' is permanent...The Register includes individuals who are positively identified as researchers, and who indicate areas of research activity directly related to the field of professional education".¹⁴

Definition of Educational Researcher

"For the purpose of the project educational researchers were therefore defined as those who are pursuing or who have recently pursued research that is directly related to the study of educational institutions, and to the spectrum of individual and social problems which arise within such institutions."¹⁵

¹³Phi Delta Kappa, National Register of Educational Researchers (Indiana: Phi Delta Kappa, Inc., 1966), pp. x-xi.

¹⁴Robert Bargar, "Who Is the Educational Researcher?" The Training and Nurture of Educational Researchers, Sixth Annual Phi Delta Kappa Symposium on Educational Research (Indiana: Phi Delta Kappa, Inc., 1965), pp. 18-19.

¹⁵Register, p. viii.

The above definition, given by Phi Delta Kappa, was the one used in this study also. The National Register of Educational Researchers was used as the population from which the sample used in this study was drawn.

Size of Sample and Sampling Procedures

Cella, in his book Sampling Statistics in Business and Economics, noted that it was possible to determine the required size of a sample to produce a given standard error.¹⁶ This method, derived from the standard error formula, controls the precision of the sample result.

The Register has been stratified into various broad areas of educational research specialization and sub-stratified into more narrow areas for the broad fields of education and psychology. The strata, together with their percentage to the total population as given in the Register, is given in Table I.

The strata listed in Table I formed the basis for the stratification of the sample taken for this study.

In order to determine the required sample size, using the indicated strata, the following formulas were used. The sample was designed for a sampling error of 10 per cent with a 95 per cent confidence coefficient:

¹⁶ Francis Cella, Sampling Statistics in Business and Economics (Oklahoma: Bureau of Business Research, 1950), p. 160.

TABLE I
STRATIFICATION FIGURES FOR THE STUDY

Strata	Relative Weight*	Sample Computations	
		$\frac{N_{str}}{N}$	$\left(\frac{N_{str}}{N}\right)^2$
Education (not specified below)	.239	.05712	.014210
Curriculum and Methods	.024	.00058	.000141
Educational Admin.	.114	.01300	.003250
Educational Research	.010	.00010	.000025
Elementary Education	.021	.00044	.000110
Hist. & Phil. of Educ.	.019	.00036	.000090
Secondary Education	.019	.00036	.000090
Special Education	.010	.00010	.000025
Psychology (not specified below)	.271	.07344	.018360
Meas., Eval., and Test.	.019	.00036	.000090
Educational Psychology	.114	.01300	.003250
Statistics and Probability	.003	.00001	.000003
Counseling and Guidance	.028	.00078	.000195
Sociology	.050	.00250	.000625
Social Studies	.021	.00044	.000110
Humanities	.016	.00026	.000065
Physical Sciences	.009	.00008	.000020
Biological Sciences	.010	.00010	.000025
TOTAL			.040758

*Register, pp. xiv-xv.

$$(1) \quad 1.96 \sqrt{\sigma_p} = .05$$

$$(2) \quad n - 1 = \frac{\sum \left(\frac{N_{str}}{N} \right)^2 P_{str} Q_{str}}{\sigma_p^2}$$

Where N_{str} = the number in a particular stratum

$$P_{str} = Q_{str} = .50$$

$$(3) \quad \text{Solving: } n = 64.$$

Where equation (1) represents the planned error being equated to the theoretical error, the sampling error (chosen to be 10 per cent) is dispersed around the population mean in such a manner as to coincide with the dispersion of the standard error. The 95 per cent confidence coefficient will result in a dispersion of 1.96 standard errors on each side of the mean. Five per cent of the planned error will be on each side of the mean.

Equation (2) was used to solve for the sample size (n) where:

$$\text{and } \sum \left(\frac{N_{str}}{N} \right)^2 P_{str} Q_{str} = .040758 \text{ (from Table I).}$$

The maximum standard error was obtained by using $p = q = .50$, which also provided the maximum size of the sample.

The number of researchers to be included in each stratum were calculated by multiplying the relative weight

of each stratum times the sample size ($n = 64$). The number in each strata of the sample is given in Table II.

The method of sampling being used is called disproportionate stratified sampling by Hansen, Hurwitz, and Madow.¹⁷ It should be noted that Hansen, Hurwitz, and Madow argue that it may be possible to seriously under-represent a particular strata using the method indicated. They suggest that if this is the case simple random sampling may give better results.¹⁸ The effect of under-representation in terms of the variance of a particular stratum being greater than a desired minimum is discussed by the authors in various places in their text.¹⁹ The recommendation given is that two representatives should be the minimum in any stratum.²⁰ The statement is made, "A possible modification of the rule, therefore, is to arbitrarily oversample the smallest size stratum, perhaps by a factor of 2...."²¹

This recommendation was applied to the sample given in Table II and all strata with only one representative were sampled so that they would have at least two representatives (the factor of 2 recommended above). With this

¹⁷Morris H. Hansen, William Hurwitz, and William Madow, Sample Survey Methods and Theory (New York: John Wiley and Sons, Inc., 1953), p. 205ff.

¹⁸Ibid., p. 218.

¹⁹Ibid., p. 204 (exercises), p. 219 and 231.

²⁰Ibid., p. 219.

²¹Ibid., p. 218.

correction the necessary sample size for this study was increased to 75. The amplified stratification is also given in Table II.

In order to obtain a random sample the following procedure was followed. Using a table of random numbers, as given in Dixon and Massey's Introduction to Statistical Analysis,²² the numbers were read across the page. The first three digits of the sequence determined the page number of the Register; the next two digits determined the researcher listed on the chosen page. The numbering of the researchers on each page began in the upper left hand corner of the page, down the first column, and then down the second column. The field of study to which the researcher was assigned was determined by the listing in the Register and his area of study or work as given in the Register. The researchers selected formed the sample for this study.

Each researcher was sent a cover letter (see Appendix A), a competency ranking form (see Appendix B), and a reply envelope. Following a three week delay (at which time the returns were very few) a follow-up letter and another ranking form were sent to all those who had not replied. This was done again following another delay.

In any mail questionnaire the problem of non-response must be considered. Since the sample was

²²Wilfrid J. Dixon and Frank J. Massey, Jr., Introduction to Statistical Analysis (New York: McGraw-Hill Book Company, Inc., 1957).

TABLE II
ORIGINAL AND AMPLIFIED SAMPLE STRATA

Stratum	Original	Amplified
Education (not listed below)	15	15
Curriculum	2	2
Educational Administration	7	7
Research	1	2
Elementary Education	1	2
History & Philosophy	1	2
Secondary	1	2
Special Education	1	2
Psychology (not listed below)	17	17
Measurement	1	2
Educational Psychology	7	7
Statistics and Probability	1	2
Counseling and Guidance	2	2
Sociology	3	3
Social Science	1	2
Humanities	1	2
Physical Science	1	2
Biological Science	1	2
TOTALS	64	75

stratified, it is very important that a 100% return be obtained. In a stratified sample it is not unusual for each member of the sample to represent more people in the population than in the ordinary random sample. If one member of the sample does not respond, theoretically the response of many in the population is lost. This response may have changed the results; thus a 100% return is very important. If some members of the stratum refused to participate, another member was selected to replace them. The selection of this member was a random selection carried out in the manner previously described. The new member of the sample was sent the cover letter and the competency ranking form.

It should be noted that the sample for this study contains the following characteristics:

1. The members have been selected by random selection methods to control bias in the selection process.
2. The precision of the results was decided upon, stated, and used in the formulation of the sample size. It has not been stated that the selection of the sample is 100% accurate; but is within the recognized sampling error.
3. The sample has been stratified by recognized techniques so that available information concerning the population can be used to reduce the size of the sample.
4. Provision was made concerning non-response, using good sampling techniques, so that a 100% return could be obtained.

However, all those characteristics do not within themselves insure that the sample is representative. It may be argued that these characteristics may "tend" to insure a representative sample but the assurance rests on a statistical test that was applied. Using the Chi-square test as described by Cella,²³ the results indicated that the sample was representative of the population and within the range of statistical restrictions previously imposed. Since the statistical test requires the use of a variable not used in the selection of the sample or one on which statistical analysis is not being performed, the variable sex of the respondent was chosen. The sample was not chosen regarding the sex of the researcher nor were any statistical analyses performed upon this variable.

Limitations and Assumptions

In that the replies from the researchers may list certain competencies in slightly different terminology, the author had to decide if the several submitted competency terms were equivalent. As with any enumeration system, some terms may be considered similar but not exact equivalents. It was in these cases where the study may be limited--limited to the decisions by the author's judgment concerning what submitted terminology would be deemed equivalent.

²³Cella, op. cit., p. 224ff.

It was assumed that the competencies of the researchers could actually be rated in rank order. It was recognized that this listing probably reflected each individual's situation. The proposed listing of the competencies was, of course, dependent upon the competencies listed and the rank assigned by each researcher, and by the research area to which he belonged.

The assumption was also made that the competencies being listed were ones that are required for current practices in the reactants research field.

Source of Data

Instead of searching the literature for "related" competencies and then forming a check list (which would restrict the answers to the ones on the list), the educational researchers in the sample were asked to list the competencies they had found to be necessary to do "good" research in their particular field. The ranking form posed one problem: The ranking of seven competencies of research. It was emphasized that the respondent was not to list broad generalizations but to be as specific as possible in his listing.

Hypotheses

The hypotheses proposed for this study were:

H₁: There is not a general competency basic to all the tested areas of educational research.

H₂: There is not a broad competency basic to some

(but not all) of the tested areas of educational research.

H₃: There is not a competency unique to each of the tested areas of educational research.

Organization of Study

The study was organized into four chapters. The first chapter contains the purpose, need, and problem to be studied. The second chapter presents the theoretical structure of the method of analysis with a brief review of pertinent relevant data. The third chapter is the presentation and discussion of the data, including a discussion of the modification of the basic form of analysis that was used. The fourth chapter contains the summary of results with the conclusions that were drawn from these results. A proposed program for the training of educational researchers is also discussed in this chapter.

CHAPTER II

THEORETICAL DEVELOPMENT AND DISCUSSION

This chapter discusses certain basic terms such as competency, competency pattern, type, and typal groups. The literature was reviewed as it related to the problem. A brief discussion of the background theory of McQuitty is also included.

Throughout this paper the word "competency" constantly appears. It is possible to define this word by the use of a synonym such as "ability", where ability is defined as a group of performances. This definition was alluded to in the follow-up letter, but was not mentioned in the original cover letter sent to members of the sample. No formal definition was given in any correspondence with the members of the sample. Without a formal definition the researcher filling out the Ranking Form had freedom to use his intuitive knowledge of "competency" in his ranking. Thus a competency could be a mental trait or even some observable physical phenomenon. The term was purposely left formally undefined as a formal definition may not apply in all areas of educational research.

To have a concept undefined is certainly not a weakness in this study. With a little reflection it can be noted that in some algebras the concept "point" is undefined, yet that does not keep the mathematician from working many problems using "point", nor does it hinder the development of properties of "point". The same discussion can apply to the term "intelligence" and its use in the realm of education. Thus it actually is not uncommon to deal quite at length with an undefined term or construct.

However, in order to try to assure that the intuitive "definition" of the concept "competency" is the same for all readers of this paper, the following "suggestion" is offered: let competency be "defined" as any concept, ability, or performance listed by the sample of researchers on the Competency Ranking Form.

Competency pattern can now be defined in a more exact manner. Competency pattern is the group of competencies that the analysis indicates are necessary for the researcher to possess in order to do quality research in his specific field.

In his report, "Does Psychological Research Support Modern Educational Theories?", Einar Kullstedt, an exchange professor from the University of Lund, Sweden, arrives at this conclusion: "...educators should be better trained in psychology and in scientific methods of research".¹ He states that the views given in his article are those most

commonly agreed upon among leading Swedish educators. This seemed to indicate that the training of those who read and interpret psychological research as well as those doing the research probably did not possess some minimum knowledge concerning research methods.

John Nicholson in his report to the Kansas Association of School Administrators and its Committee on Research, discusses major problems in research published today. He noted that the first problem for the Committee was that "much of what is called 'research' is not research at all".² Nicholson said further that most "research" reported today is fact-finding that can be done by "just looking around".³

Rutherford, in his study, appeals for a Research Specialist for each field represented in Education.⁴ He reports that these researchers must possess skills in the use of the "latest and most advanced research techniques".⁵ However, he also remarks that this will not happen until

¹Einar Kullstedt, "Does Psychological Research Support Modern Educational Theories?", Bulletin of Education, II, No. 3 (May, 1955), p. 79.

²John H. Nicholson, "The School Administrator and Research," Bulletin of Education, XVIII, No. 2 (November, 1963), p. 9.

³Ibid., p. 7.

⁴Floyd J. Rutherford, "An Analysis and Evaluation of Policies and Practices in the Selection, Training, and Employment of Science Education" (unpublished Doctor's dissertation, Harvard University, 1963), p. 123.

⁵Ibid., p. 123.

the profession discovers how to produce its own first class researchers.

Remarks similar to these above could be continued almost indefinitely. Reference to the Review of Educational Research, June, 1964, indicates that, without exception, the author of every article realized the need for more and better research in their respective fields. This remark seems to be the final statement in many dissertations; in fact, possibly no dissertation would be accepted as complete without the final section entitled "Further-Needed Research".

The main question underlying the previous paragraph should be: Who is to do this research? Obviously financial matters, time limit, or both has kept the various authors of dissertations from doing the further research indicated. The question may be asked: Are there competent researchers to do this "needed" research in Education? Much research is published but the evidence seems to indicate that this "research" is not necessarily quality research.

Bereiter has given what he called a straightforward remedy for obtaining good research: "We should stop wasting our time on descriptive studies, product evaluation, and testing every opinion which happens to have gained a following, and begin developing and testing theories."⁶

⁶Carl Bereiter, "Issues and Dilemmas in Developing Training Programs for Educational Researchers," The Training and Nurture of Educational Researchers (Bloomington, Indiana: Phi Delta Kappa, 1965), p. 97.

He notes that the present state of research cannot be improved by "ordinary" procedures that are applied to the improvement of graduate training. One "ordinary" way consists of setting higher standards for the acceptability of dissertations. However, the fact is that this generally emphasizes form over content. The important point is that a decision must be made as to what is relevant content and what is not relevant content in any training program. Requiring other standards that do not acquaint the potential researcher with his field or with research methods also does not solve the problem.

This false consideration of "higher standards" was discussed by Rutherford.⁷ He noted that the cry for higher standards was not new but has appeared consistently and continuously in higher education. Rutherford also quotes a study to indicate that the candidates today are "better than the candidates in the previous decade" (emphasis his).⁸

Evidently what is needed in the improvement in the programs for preparing educational researchers is a theoretical structure of competencies necessary to do research. This is alluded to by Bereiter in his conclusions that the programs cannot be improved until we know for what we are training.⁹

⁷Rutherford, op. cit., p. 150.

⁸Ibid., p. 150.

⁹Bereiter, op. cit., p. 106ff.

Ness conducted a canvass of 104 institutions in the United States that offered the Ed.D. degree or the Ph.D. degree.¹⁰ This study was similar to the study by Sieber quoted previously. Ness was interested in the training of researchers and the requirements of each institution for their research students. This study by Ness was reviewed by Krathwohl in Phi Delta Kappa's The Training and Nurture of Educational Researchers.¹¹ This review considered the training in research methods, statistics, experimental design, measurement, and research experience. It should also be noted here that under the topic research methods, computer coding and programming was listed as a requirement by many of the colleges.¹² The conclusion, given by Krathwohl, was that "the most common pattern of requirements is that of work in research methods plus statistics...The doctoral graduate expecting to do research is likely to have at least a minimal exposure to the tools of the trade."¹³ The quality of these courses is, of course, a vital question that should be considered.

¹⁰Frederic W. Ness, A Guide to Graduate Study (Washington, D.C.: American Council on Education, 1960), p. 455.

¹¹David R. Krathwohl, "Current Formal Patterns of Educating Empirically Oriented Researchers and Methodologists," The Training and Nurture of Educational Researchers (Bloomington, Indiana: Phi Delta Kappa, 1965), p. 73-92.

¹²Ibid., p. 77.

¹³Ibid., p. 80.

However, the conclusion reached by Sieber, that a coordinated training program is uncommon, was also reiterated in the study by Ness.

Krathwohl has offered a theoretical basis for a research program and he notes that the orientation of a program could be one of three orientations: methodologist, social science, or professional education.¹⁴ These are placed in a three-dimensional space by Krathwohl, with some overlap between each of the orientations, but the specific orientation indicates the basic courses the student would take in his preparation. The faculty that teaches the research courses was also discussed in Krathwohl's article and recommendations offered. However, this is a separate problem from the orientation of this study.

Halpin has actually scathed research with his statement, "We have developed special gimmicks for justifying the debasement of research."¹⁵ One of these gimmicks he describes is "further research". He notes that it is not "more research" that is needed but we need to have the courage to act on the results of the research that we have at present. Halpin seems to be saying that the plea for "further research" on a topic is sometimes just a delaying

¹⁴Ibid., p. 85.

¹⁵Andrew W. Halpin, "Problems in the Use of Communication Media in the Dissemination and Implementation of Educational Research," Dissemination and Implementation of Educational Research (Bloomington, Indiana: Phi Delta Kappa, 1962), p. 172.

tactic and that we are afraid to apply the results of present research because it may "change the way of doing something" or it may cause someone to get mad at the researcher. Thus we encourage "further research" and put off the problem for a while.

Halpin continues to criticize research by attacking research standards and the training of researchers. He implies in the remainder of his article that the quality of research in all fields (except medicine) is quite inferior to what it should be. He blames the inferior quality upon those who teach the methods to the students. He notes that the decline in research quality began after the thirties and has continued until this day.¹⁶ This is further emphasized by the example of a university acquiring a professor that has good research qualities (both in teaching and in his own research) and then the other teachers directing their students around this professor in many devious manners.¹⁷ Thus the objective of some type of standard of quality in research has been circumvented. The university gives a degree but does not produce a good product.

Cronbach gives a good summary for all the previous remarks. His article, "The Role of the University in Improving Education", which appeared in the June, 1966, Phi Delta Kappan, develops the research problem that has been

¹⁶Ibid., p. 176ff.

¹⁷Ibid., p. 179.

discussed in this paper and summarizes the conclusions that have been alluded to here.¹⁸ Cronbach says: "Too often we have had just one kind of research in mind as a model, and our methods for training and for nurturing research have suffered in consequence." His recommendations are also similar to those given by Halpin,¹⁹ Krathwohl,²⁰ and Rutherford.²¹ These recommendations include the following:

1. Research should be largely centered in universities since only the university has the long range view that permits detached and penetrating inquiry.
2. The highest priority should be given to recruitment and training of researchers. This calls for the breaking down of the barriers that now exist between the various departments of the university.²²

In the Phi Delta Kappan, June, 1966, the National Register of Educational Researchers, from which the sample for this study was drawn, received a good critical review.²³ The criticisms were mostly concerned with the physical compilation of the Register, but the sampling procedure of the Register was also questioned. A reply to the latter

¹⁸Lee J. Cronbach, "The Role of the University in Improving Education," Phi Delta Kappan, XLVII, No. 10 (June, 1966), pp. 539-545.

¹⁹Halpin, op. cit., p. 199.

²⁰Krathwohl, op. cit., p. 91ff.

²¹Rutherford, op. cit., p. 175ff.

²²Cronbach, op. cit., p. 544.

²³George Arnstein, "Research Register: A Good Idea Poorly Implemented?", Phi Delta Kappan, XLVII, No. 10 (June, 1966), pp. 582-584.

criticism was printed in the same issue of the Kappan.²⁴ The reply, by Robert Bargar, further defined the sample of the Register and again offered arguments to the effect that the Register is representative of the population of educational researchers, according to the definition given by Phi Delta Kappa. This definition is the one used in this study.

All of these articles apparently are directed toward the need for an answer to the question: What is the composition of the pattern of competencies of the educational researcher, if the quality of the research activity is to be improved? This then is the intention of this study.

Since this study will not utilize the usual type of data, discussion is needed to describe several terms and also to give some theoretical consideration of the rationale of the statistical procedures used in their analysis.

For the purpose of this study the definition of a researcher type is the one that is given by McQuitty: "A typal structure is defined as one in which every member of a type is more like some other member of that type (with respect to the data analyzed) than he is like any member of any other type."²⁵ This is to say that a researcher

²⁴Robert Bargar, "Mr. Bargar Replies," Phi Delta Kappan, XLVII, No. 10 (June, 1966), pp. 584-585.

²⁵Louis L. McQuitty, "Elementary Linkage Analysis for Isolating Orthogonal and Oblique Types and Typal Relevancies," p. 3 (Mimeographed.)

classified in a particular type (group) will have listed competencies on the competency ranking sheet more like those listed by others in that type (group) than anyone else in the analysis.

The basic form of the analysis used in this study was developed by McQuitty.²⁶ Use is made of the concept of elementary linkage analysis and with modification for differential linkage analysis.

It is necessary to discuss briefly the paradox referred to by McQuitty as the Meehl Paradox since this theory is part of the theoretical structure of the analytical technique. Meehl has discussed the situation where two test items taken jointly will show a high correlation with a particular criterion, but when treated separately will have zero correlation with the criterion.²⁷

This serves to illustrate that items may have predictive values when treated in combinations (groups of researchers) that are not apparent when analyzed individually (with respect to a criterion). That is, one response from a particular researcher may not indicate the competencies that underlie his particular field of research, but within a group of researchers' responses an analysis may isolate factors (competencies) that are indicated by

²⁶Ibid., p. 3.

²⁷P.E. Meehl, "Configural Scoring," Journal of Consulting Psychology, XIV (1950), pp. 165-171.

the researcher group to be general or specific. The criterion to which these are related can be described as competencies necessary to do "good" research in the particular field under consideration. Taken separately each response may indicate nothing but when taken as a group a theoretical structure may be developed.

Based upon the Meehl Paradox, McQuitty notes that differential linkage analysis (which is the technique used in this study) "can be used in selecting sets of items to differentiate types of persons in one category from those in another category."²⁸ By application of this method to the data, two listings of competencies were obtained: (1) those competencies specific to a particular field of research (differentiates the two groups); and (2) those competencies common to the two fields of research. McQuitty does not use the second group as he was only interested in the differentiating items; however, in this paper, the modification was made in that both groups of items were retained.

Two types of data may be recognized; ordered and unordered.²⁹ Ordered data is of the type where the test results are first ordered to linear continua and the inter-relationships of the standings are studied. The type of data in this study is unordered: there is no fixed

²⁸McQuitty, op. cit., p. 22.

²⁹Ibid., p. 8.

arrangement along a continuum. There is an index of association required by this analytical technique. In this study the Spearman Rank-Order Coefficient of Correlation was used. It is noted here that the interpretation of this index of association is important to the theoretical discussion of the method and this interpretation is not necessarily the usual one. This is discussed in detail later in the paper.

The investigator can assume that the response items measure the same characteristics across all subjects and the assumption of invariant validity applies. An index of association between people can be calculated also with the underlying assumption that the responses to items measure different characteristics across different people. This gives us the assumption of differential validity and we assume interaction variance in the types. This latter theory applies to this study.

Irrespective of the point of view relating to the index of association, the method, according to McQuitty, can be applied correctly.³⁰ Even though the responses to individual items may, in general, be unreliable, they may possess the "differential reliability" across people that was mentioned earlier; i.e., a particular response may be

³⁰Louis L. McQuitty, "Capabilities and Improvements of Linkage Analysis as a Clustering Method," Educational and Psychological Measurement, XXIV, No. 3 (Fall, 1964), p. 455.

unreliable singularly, but the members of a particular type competency may give a particular response invariably, even though other individuals will vary with respect to the level of the response.³¹

Spearman's rank order correlation coefficient index of association compares the relative ranking of the responses. By this method all individuals making the response must be ranking the same set of items.³² The competency ranking sheet (see Appendix A), did not list specific items and it was possible, if only by chance alone, that two researchers in the same category would list a competency not included on another researcher's listing. It is this possibility that was referred to in the previous paragraphs concerning unordered data. Each reply may be relatively unreliable; however, in order to obtain our index of association adjustments in the responses must be made. McQuitty refers to a theory of types in support of the adjustment to be made.³³ Briefly, the theory notes that if two individuals, A and B, belong to a particular type, T, then (at least theoretically) they will give similar answers to a set of items, S, which defines the type. That is to say that if researchers A and

³¹McQuitty, "Elementary Linkage Analysis...", p. 9.

³²Allen L. Edwards, Statistical Methods for the Behavioral Sciences (New York: Holt, Rinehart, and Winston, Inc., 1964), p. 194.

³³McQuitty, "Capabilities and Improvements...", p. 449.

B were both in the physical science area, the competencies they listed on the competency ranking form should have been, theoretically, the same. It should be noted that this does not imply that they would be of the same rank in that unordered data was involved, but the rank order correlation coefficient should be great enough to indicate a high degree of agreement of relative ordering.

Applying the theory, let us assume that A and B have answered the competency ranking form and each list a competency that is not included on the list of the other. The items on which they disagreed are classified, according to McQuitty, as "irrelevant" and do not define the type and thus are assumed to have resulted from chance. These items are eliminated from their respective listing. This event is treated more in detail later in this paper.

Each type was assumed to have a prototype. A prototype is one individual who best represents the type. The prototype could be real or hypothetical. The prototype is actually the reference factor for a particular type.

Responses should be interpreted as having similar meanings only among the members of a single type. McQuitty offers an illustration of this which is too long to be quoted here; however, different frames of reference (defined here in the context of how research is perceived in the various areas) may imply that all responses to the ranking form may not have the same meaning for researchers in

different areas.³⁴ Thus the correlation coefficient between members of two different types is not to be interpreted in the usual sense; e.g., to indicate the extent to which two persons are alike, but it is to be used in the analytical method only for the purposes of analysis. The coefficient is a representative of "alikeeness" in an entirely objective sense, excluding the psychological analyses. The coefficient indicates in this study only relative placement. The correlation coefficients are used to determine the type to which an individual belongs. It is not the purpose of this paper to apply any other interpretation nor to infer any psychological analysis.

The preceding theory and applications define a matrix of intercorrelations between members of a type, but the linkage analysis requires that correlation coefficients be computed between types also. Again, the problem arises concerning the number of competencies for which to compute correlations. It is not possible to compute a rank order correlation coefficient between two groups when one group ranked N objects and another M objects when $N \neq M$. Also it even is possible that some of the competencies ranked in one group were not ranked in the other group. In order to develop the sections of the matrices requiring correlation coefficients between groups the following practices and

³⁴McQuitty, "Elementary Linkage Analysis...", pp. 3-6.

theory were applied. If the two groups did not rank any of the same competencies they were considered as having ranked only specific competencies relevant to each particular group. No attempt was made to develop correlations between these groups. Thus no general competency may exist between these particular types. If the two groups contained common competencies the following procedures were used. The competency listings of the groups were compared until a list was obtained in each group that has common competencies with the other group; i.e., both groups ranked the same competencies and the same number of competencies in the final analysis.

It would seem at first glance that this procedure is too restrictive and that the correlations obtained here would not be comparable to those obtained within each group. However, closer examination will indicate these reactions are not valid criticisms of the procedure. McQuitty developed the "Classification Assumption" to meet the need for considering reduction of the competency list of two groups to a common list in order to obtain an index of association (in this case the rank order correlation coefficient).³⁵ The classification assumption notes that all members of a type are assumed to have as many common characteristics as are possessed by the pair with the

³⁵Louis L. McQuitty, "Hierarchical Syndrome Analysis," Educational and Psychological Measurement, XX, No. 2 (Summer, 1960), p. 295.

fewest characteristics. As an example let us suppose that a particular group, A, has n characteristics in common.

Suppose that group B has m characteristics in common and that group C has k characteristics in common. Further

assume that n is less than m in numerical value and that n is less than k, also. If the groups A, B, and C form

a type (ABC), then ABC is assumed to have as many common characteristics as possessed by A (which had the fewest).

Concerning this assumption, McQuitty says: "An important consideration is that the assumption need not be absolutely valid; the only requirement is that valid categories have higher estimates than competing ones."³⁶ "The assumption

can never yield an underestimate; a category cannot have more common characteristics than are possessed by any two members of the category."³⁷ Thus, if the assumption was

made that a type might exist between two groups, the classification assumption was applied, and the rank order correlation was computed. It should be noted that the classification assumption was applied to a hierarchical arrangement in linkage analysis by McQuitty but since the competencies may be thought of as in a hierarchical arrangement (general competency, broad area competency, specific competency) the method also applies here.

³⁶McQuitty, "Hierarchical Syndrome...", p. 295.

³⁷Louis L. McQuitty, "Hierarchical Linkage Analysis for the Isolation of Types," Educational and Psychological Measurement, XX, No. 1 (Spring, 1960), p. 59.

Again, it should be noted that the correlation coefficients are not to be compared between groups and that the coefficient is merely an indication of relative placement.

The theory has been developed and a method of application determined that meets the requirements of the theory but we still have the questions of reliability and validity that should be answered. Kerlinger notes: "The subject of validity is complex, controversial, and peculiarly important in psychological and educational research...The commonest definition:...are we measuring what we think we are measuring?"³⁸ Kerlinger also gives several synonyms for reliability: "...dependability, stability, consistency, predictability."³⁹

Concerning validity and reliability of the method McQuitty reports that he has conducted research that produced findings related to typal theory.⁴⁰ These results indicated that when elementary linkage analysis was applied to a matrix of n less than 100, the results were of types of low reliability but high validity. This has previously been alluded to in the discussion of ordered and unordered data and the relationship of the individual response to the

³⁸Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart, and Winston, Inc., 1965), p. 444.

³⁹Ibid., p. 429.

⁴⁰McQuitty, "Elementary Linkage Analysis...", p. 19.

group response patterns. However, how "low" the "low" reliability is was not defined by McQuitty, but he has used his method many times on matrices with as few as three elements being considered.⁴¹

⁴¹Louis L. McQuitty, "Rank Order Typal Analysis," Educational and Psychological Measurement, XXIII, No. 1 (Spring, 1963), pp. 55-61.

CHAPTER III

PRESENTATION AND DISCUSSION OF DATA

Method of Analysis

The method of analysis of the response data used in this study was an application of McQuitty's Differential Linkage Analysis to the response data of the researchers. The usual application of Differential Linkage Analysis is to select patterns of responses which differentiate between two or more categories of people. In this study the categories were the various areas of research of the individual respondents. Using this technique it is possible to obtain a basis for differentiating competencies necessary for particular areas of research.

Differentiation was not the main purpose of this study, however. Communalities among the areas of research was of greater importance. This study was interested in one or more general competencies (i.e., common to all fields of research tested), one or more broad competencies (i.e., common to two or more fields of research), and specific competencies (i.e., unique to a particular area of research), if such competencies did indeed exist. Thus a modification of the basic Differential Linkage Analysis technique was

necessary to obtain this information. This modification is described in the steps given below.

The procedures used in the analysis were (refer to Figure 1):

1. Formulate a matrix of indices of association between the two areas of research being analyzed. List the individuals of one group (i.e., group one in this analysis) first, followed by the individuals of the next group (group two). Quadrant A of the matrix consisted of indices only among the first group; quadrant D, of indices only among the second group. The other two quadrants, B and C, consisted of indices among both groups.

2. Using only quadrant A of the matrix the highest entry in each column was underlined. Then, in each column, the individual in group two most like the individual in group one was located. This was accomplished by underlining the highest entry in each column in quadrant C of the matrix. Thus each individual of group one is linked with an individual of group two. The same is done with the individuals of group two. When this linking (or associating) is finished, each individual in group one is linked with an individual of group two; each individual in group two is linked with an individual in group one. Since the individual sections of the matrix may possess different numbers of individuals the associations may not necessarily be reciprocal.

3. Two complete linkage analyses were then performed. The first was performed on group one and the second on group two. The first pertained only to quadrant A of the matrix, the second only to quadrant D. However, whenever an individual of group one is classified in the first analysis the individual selected most like him was classified also. In the second analysis (on group two), when an individual of group two was classified the individual of group one most like him was classified also. Thus obtained was a type of group one (with associated group two), and a type of group two (with associated group one.)

		Group I								Group II							
		1	2	3	.	.	.	.	N_1	1	2	3	.	.	.	.	N_2
Group I	1	Quadrant A								Quadrant B							
	2																
	3																
	.																
	.																
	N_1																
Group II	1	Quadrant C								Quadrant D							
	2																
	3																
	.																
	.																
	N_2																

Fig. 1--Illustrative Matrix used in Differential Linkage Analysis for group similarities.

4. Linkage analysis as previously referred to was performed in the following manner:

(a) Underline the highest entries in each column of the matrix (or section of a matrix).

(b) Select the highest entry in the matrix (or section). This indicates the basic pair or reciprocals.

(c) Select the first cousins of the reciprocal pair by reading across the rows of the two related pair. By selecting the underlined entries in these rows (if any exist) the individuals most like the reciprocal pair are found.

(d) Proceed in an analogous manner to select those most like the first cousins and so forth.

(e) Excluding all already classified continue the steps (b) to (d) until all were classified.

5. Each type was analyzed to produce a set of competencies. To do this the competencies on which all of the individuals of the type reached agreement were listed. The same was done for the associated individuals. The sets of competencies were compared and the competencies in common noted as well as the differential competencies. The same procedure was followed for the individuals of group two and their associated individuals. Agreement is reached when the competencies were ranked on or above the median rank of the particular set being analyzed.

6. These lists of competencies were retained and similar analyses were performed between all other groups. Competencies were added to the lists as subsequent analyses indicated the necessity of doing so. Thus the lists of common and of unique competencies were formed. If a competency appeared on all lists it was classified as a general competency. Those appearing on two or more lists were classified as broad competencies for those particular areas, and those appearing on only one list were classified as specific competencies.

7. Applying the definition of type and the classification assumption, a type cannot be obtained from groups that possess less competencies in common than the number of competencies possessed by the group with the smallest number. In the process of forming the groups of researchers the smallest number of competencies in common were four; thus if two groups listed less than four

competencies in common no attempt was made to obtain indices of association between the groups.

8. In Figure 1, N_1 may or may not be equal to N_2 .

Classification of Competencies

The Competency Ranking Form was not structured to being a check list, thus a single competency may have been listed, by those responding, in slightly different forms. The forms that were judged equivalent were listed under one topic heading for the final analysis. All competencies were finally listed under one of twenty-one topic headings. Several competencies that were listed only once by only one researcher were not compiled in the final listing, as these would be dropped from the analysis by the method used to get the indices of association. No loss resulted by not listing these competencies.

Table III presents the classification used in the analysis. The right column illustrates the various ways a particular competency appeared on some of the ranking forms illustrating some of the competency statements that were judged equivalent. The left column is the category into which the equivalent forms were placed finally. A brief explanation of the category is also given.

The Matrices of Indices of Association

All groups of researchers did not list in common the four or more competencies needed in order to compute

TABLE III
CLASSIFICATION OF COMPETENCIES

CLASSIFICATION given to the competency	COMPETENCY as reported on the Competency Ranking Form
A. STATISTICS. Introductory courses; reading knowledge of statistics, inferential and descriptive.	Statistical skills; applied statistics; knowledge of statistical procedures, etc.
B. COMMUNICATION SKILLS. The ability to write papers in readable form; speaking ability.	Ability to organize data; good writing ability; scientific method writing; ability to communicate with faculty untrained in statistical methodology; editorial consultant, etc.
C. REVIEW OF LITERATURE. Reading of the professional journals; knowledge of related research in other areas.	Adequate library, relevant research; knowledge of field; familiarity with past research, etc.
D. RESEARCH DESIGN. Basic understanding of good research designs; one course in research methods.	Research design; research design of studies in various fields, etc.
E. GENERALIZATION. Knowledge of when generalization is possible; how to gain information from data collected; interpretation of data.	Interpretation of data; ability to interpret findings; ability to generalize; ability to conceptualize; etc.
F. PEER GROUP. Working <u>with</u> people in the research; ability to supervise yet work with those being supervised.	Ability to get cooperation; working with people; human relation skills; enlisting staff cooperation, etc.

TABLE III--Continued

CLASSIFICATION given to the competency	COMPETENCY as reported on the Competency Ranking Form
G. DEVELOPING THE PROBLEM. The ability to define the problem in such a way that it can be tested; ability to recognize when a problem exists.	Idea of a problem; ability to read data and research for a problem; awareness of researchable problems, etc.
H. MEASUREMENT. General ability to classify groups according to the criterion of the study.	Measurement; specific scales to use; theory of measurement; etc.
I. LEARNING THEORY. Basic knowledges.	Learning theory.
J. PHILOSOPHY. Basic courses in educational philosophy.	Philosophical Analysis of ideas.
K. SOCIAL PROCESS. Social class pressures; social class distinctions; how society develops; social psychology.	Analysis of Social Process.
L. COMPUTER. Knowledge of limitations of computers; knowledge of card forms; ability to read print outs.	Computer skills; data processing skills; programming ability, etc.
M. BUSINESS ABILITY. Ability to delegate duties; ability to secure grants.	Ability to secure grants; ability to keep costs low; supervision; etc.
N. PERSISTENCE. Staying with the project until completion; ability to continue detailed work.	Persistence; perseverance; patience; etc.

TABLE III--Continued

CLASSIFICATION given to the competency	COMPETENCY as reported on the Competency Ranking Form
O. MATHEMATICS. Any type of specific mathematics course, per se; calculus; probability theory; mathematical statistics; etc.	Mathematics; mathematical theory of statistics; etc.
P. OBSERVATIONS. Ability to make accurate observations of phenomena.	Perceptive observations.
Q. COMMON SENSE.	Common Sense.
R. READING SKILLS. Ability to read fast and to understand the material; library skills.	Reading skill; scanning skills; etc.
S. CREATIVITY.	Creativity.
T. HEALTH. The good physical health of the researcher.	Health; good health; etc.
U. CLINICAL EXPERIENCE. Internship in a clinic; clinical employment.	Clinical Experience.

the indices of association between the groups. The following list indicates the groups for which indices of association were computed. The group listed at the heading is associated, by at least four competencies, with all those listed below it. The list is not redundant; e.g., counseling and guidance area of research was associated with curriculum in the first listing, thus counseling and guidance will not

be repeated under the curriculum listing and as such, later listings may appear shorter than was necessary for the analysis.

The list is as follows:

CURRICULUM

- Social Science
- Physical Science
- Secondary Education
- Special Education
- Educational Research
- History and Philosophy of Education
- Elementary Education
- Sociology
- Education
- Educational Psychology

COUNSELING AND GUIDANCE

- Curriculum
- Physical Science
- History and Philosophy of Education
- Elementary Education
- Education
- Educational Psychology

EDUCATIONAL RESEARCH

- History and Philosophy of Education
- Sociology
- Educational Psychology

HISTORY AND PHILOSOPHY OF EDUCATION

- Educational Psychology

PROBABILITY AND STATISTICS

- Measurement
- Education

SOCIAL SCIENCE

- History and Philosophy of Education
- Elementary Education
- Education

ELEMENTARY EDUCATION

- Education

Table IV presents the original matrices of indices of association that were used in the analysis. Appendix D

presents the original eighteen areas of research activity specialists sampled and the competencies on which they agreed.

TABLE IV-A

MATRICES OF INDICES OF ASSOCIATION
Curriculum - Social Science

	I	II	1	2
I		.68	-.80	-.80
II	.68		-1.00	-1.00
1	-.80	-1.00		.77
2	-.80	-1.00	.77	

TABLE IV-B

MATRICES OF INDICES OF ASSOCIATION
Curriculum - Physical Science

	I	II	1	2
I		.68	-.80	-.40
II	.68		-.40	-.80
1	-.80	-.40		.80
2	-.40	-.80	.80	

TABLE IV-C

MATRICES OF INDICES OF ASSOCIATION
Curriculum - Secondary Education

	I	II	1	2
I		-.68	.40	.40
II	.68		.40	.40
1	.40	.40		1.00
2	.40	.40	1.00	

TABLE IV-D

MATRICES OF INDICES OF ASSOCIATION
Special Education - Curriculum

	I	II	1	2
I		.90	-.60	-.30
II	.90		-.70	-.50
1	-.60	-.70		.68
2	-.30	-.50	.68	

TABLE IV-E

MATRICES OF INDICES OF ASSOCIATION
Curriculum - Educational Research

	I	II	1	2
I		.68	.10	-.10
II	.68		-.20	-.70
1	.10	-.20		-.30
2	-.10	-.70	-.30	

TABLE IV-F

MATRICES OF INDICES OF ASSOCIATION
Curriculum - History and Philosophy

	I	II	1	2
I		.68	-.10	.70
II	.68		-.30	.50
1	-.10	-.30		.09
2	.70	.50	.09	

TABLE IV-G

MATRICES OF INDICES OF ASSOCIATION
Curriculum - Elementary Education

	I	II	1	2
I		.68	.38	.20
II	.68		.20	.40
1	.38	.20		.80
2	.20	.40	.80	

TABLE IV-H

MATRICES OF INDICES OF ASSOCIATION
Curriculum - Sociology

	I	II	1	2	3
I		.68	.40	.80	.40
II	.68		-.20	-.40	-.20
1	.40	-.20		.90	.40
2	.80	-.40	.90		.30
3	.40	-.20	.40	.30	

TABLE IV-I
MATRICES OF INDICES OF ASSOCIATION
Curriculum - Education

	I	II	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I		.68	1.00	.40	.40	1.00	.00	.40	.20	.60	-.80	.40	.60	.80	.40	.60	-.20
II	.68		.80	.20	.20	.68	-.40	-.80	.40	.50	-.40	.20	.00	.40	.20	.80	.40
1	1.00	.80		.30	.50	.60	-.20	-.50	.30	.10	-.90	.30	-.30	.70	.30	.60	.00
2	.40	.20	.30		.90	.10	.30	.60	1.00	.90	-.60	1.00	.70	.70	.70	-.10	.30
3	.40	.20	.50	.90		.30	-.10	.50	.90	.80	-.70	.90	.60	.60	.40	.30	.50
4	1.00	.68	.60	.10	.30		-.60	-.30	.10	.30	-.30	.10	.10	.10	.10	.80	.60
5	.00	-.40	-.20	.30	-.10	-.60		.10	.30	.10	-.10	.30	.00	.50	.70	-.90	-.70
6	.40	-.80	-.50	.60	.50	-.30	.10		.60	.70	.20	.60	.90	-.10	.10	-.30	.50
7	.20	.40	-.30	1.00	.90	.10	.30	.60		.90	-.60	1.00	.70	.70	.70	-.10	.60
8	.60	.50	.10	.90	.80	.30	.10	.70	.90		-.30	.90	.90	.40	.60	.00	.60
9	-.80	-.40	-.90	-.60	-.70	-.30	-.10	.20	-.60	-.30		-.60	-.10	-.90	-.50	-.30	.10
10	.40	.20	.30	1.00	.90	.10	.30	.60	1.00	.90	-.60		.70	.70	.70	-.10	.30
11	.60	.00	-.30	.70	.60	.10	.00	.90	.70	.90	-.10	.70		.00	.90	-.10	.70
12	.80	.40	.70	.70	.60	.10	.50	-.10	.70	.40	-.90	.70	.00		.80	-.10	-.30
13	.40	.20	.30	.70	.40	.10	.70	.10	.70	.60	-.50	.70	.90	.80		-.40	-.20
14	.60	.80	.60	-.10	.30	.80	.90	-.30	-.10	.00	-.30	-.10	-.10	-.10	-.40		-.20
15	-.20	.40	.00	.30	.80	.60	-.70	.50	.30	.60	.10	.30	.70	-.30	-.20	-.30	

TABLE IV-J

MATRICES OF INDICES OF ASSOCIATION
Educational Psychology - Curriculum

	1	2	3	4	5	6	7	I	II
1		.60	-.80	.30	-.60	.80	-.10	1.00	.60
2	.60		-.60	.10	.20	.40	-.30	.60	.20
3	-.80	-.60		-.70	.40	-.30	-.40	-.80	-.40
4	.30	.10	-.70		-.10	-.30	-.60	.30	.30
5	-.60	.20	.40	-.10		-.60	-.30	-.60	-.20
6	.80	.40	-.30	-.30	-.60		-.30	.80	.40
7	-.10	-.30	-.40	-.60	-.30	-.50		.10	-.30
I	1.00	.60	-.80	.30	-.60	.80	-.10		.68
II	.60	.20	-.40	.50	-.20	.40	-.30	.68	

TABLE IV-K

MATRICES OF INDICES OF ASSOCIATION
Counseling and Guidance - Curriculum

	I	II	1	2
I		.71	.00	-.20
II	.71		.30	.10
1	.00	.30		.68
2	-.20	.10	.68	

TABLE IV-L

MATRICES OF INDICES OF ASSOCIATION
Counseling and Guidance
Physical Science

	I	II	1	2
I		.71	.20	.40
II	.71		.40	.78
1	.20	.40		.80
2	.40	.78	.80	

TABLE IV-M

MATRICES OF INDICES OF ASSOCIATION
Counseling and Guidance
History and Philosophy

	I	II	1	2
I		.71	-.78	-.80
II	.71		.37	.40
1	-.78	.37		.09
2	-.80	.40	.09	

TABLE IV-N

MATRICES OF INDICES OF ASSOCIATION
Counseling and Guidance
Elementary Education

	I	II	1	2
I		.71	.80	.40
II	.71		.40	.80
1	.80	.40		.80
2	.40	.80	.80	

TABLE IV-0
MATRICES OF INDICES OF ASSOCIATION
Counseling and Guidance
Education

	I	II	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I		.71	.40	1.00	1.00	.40	.80	.20	.90	.80	-.80	.90	.40	.80	.90	-.40	.00
II	.71		.40	1.00	1.00	.40	.80	.20	.90	.80	-.80	.90	.40	.80	.90	-.40	.00
1	.40	.40		.30	.50	.60	-.20	-.50	.30	.10	-.90	.30	-.30	.70	.30	.60	.00
2	1.00	1.00	.30		.90	.10	.30	.60	1.00	.90	-.60	1.00	.70	.70	.70	-.10	.30
3	1.00	1.00	.50	.90		.30	-.10	.50	.90	.80	-.70	.90	.60	.60	.40	.30	.50
4	.40	.40	.60	.10	.30		-.60	-.30	.10	.30	-.30	.10	.10	.10	.10	.80	.60
5	.80	.80	-.20	.30	-.10	-.60		.10	.30	.10	-.10	.30	.00	.50	.70	-.90	-.70
6	.20	.20	-.50	.60	.50	-.30	.10		.60	.70	.20	.60	.90	-.10	.10	-.30	.50
7	.90	.90	-.30	1.00	.90	.10	.30	.60		.90	-.60	1.00	.70	.70	.70	-.10	.30
8	.80	.80	.10	.90	.80	.30	.10	.70	.90		-.30	.90	.90	.40	.60	.00	.60
9	-.80	-.80	-.90	-.60	-.70	-.30	-.10	.20	-.60	-.30		-.60	-.10	-.90	-.50	-.30	.20
10	.90	.90	.30	1.00	.90	.10	.30	.60	1.00	.90	-.60		.70	.70	.70	-.10	.30
11	.40	.40	-.30	.70	.60	.10	.00	.90	.70	.90	-.10	.70		.00	.90	-.10	.70
12	.80	.80	.70	.70	.60	.10	.50	-.10	.70	.40	-.90	.70	.00		.80	-.10	-.30
13	.90	.90	.30	.70	.40	.10	.70	.10	.70	.60	-.50	.70	.90	.80		-.40	-.20
14	-.40	-.40	.60	-.10	.30	.80	.90	-.30	-.10	.00	-.30	-.10	-.10	-.10	-.40		-.20
15	.00	.00	.00	.30	.80	.60	-.70	.50	.30	.60	.10	.30	.70	-.30	-.20	-.30	

TABLE IV-P

MATRICES OF INDICES OF ASSOCIATION
Counseling and Guidance
Educational Psychology

	I	II	1	2	3	4	5	6	7
I		.71	.80	.40	.00	-.80	-.40	1.00	-.80
II	.71		.40	-.20	.40	-1.00	-.80	.80	-.60
1	.80	.40		.60	-.80	.30	-.60	.80	-.10
2	.40	-.20	.60		-.60	.10	.20	.40	-.30
3	.00	.40	-.80	-.60		-.70	.40	-.30	-.40
4	-.80	-1.00	.30	.10	-.70		-.10	-.30	-.60
5	-.40	-.80	-.60	.20	.40	-.10		-.60	-.30
6	1.00	.80	.80	.40	-.30	-.30	-.60		-.50
7	-.80	-.60	-.10	-.30	-.40	-.60	-.30	-.50	

TABLE IV-Q

MATRICES OF INDICES OF ASSOCIATION
Educational Psychology
Educational Research

	I	II	1	2	3	4	5	6	7
I		.60	-.80	.30	-.60	.80	-.10	.40	-.20
II	.60		-.60	.10	.20	.40	-.30	.80	.60
1	-.80	-.60		-.70	.40	-.30	-.40	-.80	.40
2	.30	.10	-.70		-.10	-.30	-.60	.60	-.80
3	-.60	.20	.40	-.10		-.60	-.30	.20	.40
4	.80	.40	-.30	-.30	-.60		-.50	-.50	.20
5	-.10	-.30	-.40	-.60	-.30	-.50		.80	-.40
6	.40	.80	-.80	.60	.20	-.40	.80		-.30
7	-.20	.60	.40	-.80	.40	.20	-.40	-.30	

TABLE IV-R

MATRICES OF INDICES OF ASSOCIATION
History and Philosophy
Educational Research

	I	II	1	2
I		.09	.60	.80
II	.09		-.20	-.40
1	.40	-.20		.30
2	.20	-.40	-.30	

TABLE IV-S

MATRICES OF INDICES OF ASSOCIATION
Educational Research
Sociology

	I	II	1	2	3
I		-.30	-.80	-.40	-.80
II	-.30		.80	1.00	.80
1	-.80	.80		.90	.40
2	-.40	1.00	.90		.30
3	-.80	.80	.40	.30	

TABLE IV-T

MATRICES OF INDICES OF ASSOCIATION
History and Philosophy of Education
Educational Psychology

	I	II	1	2	3	4	5	6	7
I		.09	-.40	.80	.20	-.40	.80	-.80	.40
II	.09		.80	-.40	-.40	.20	-1.00	1.00	.40
1	-.40	.80		.60	-.80	.30	-.60	.80	-.10
2	.80	-.40	.60		-.60	.10	.20	.40	-.30
3	.20	-.40	-.80	-.60		-.70	.40	-.30	-.40
4	-.40	.20	.30	.10	-.70		-.10	-.30	-.60
5	.80	-1.00	-.60	.20	.40	-.10		-.60	-.30
6	-.80	1.00	.80	.40	-.30	-.30	-.60		-.50
7	.40	.40	-.10	-.30	-.40	-.60	-.30	-.50	

TABLE IV-U

MATRICES OF INDICES OF ASSOCIATION
Probability and Statistics
Measurement

	I	II	1	2
I		.50	.00	-1.00
II	.50		.40	-.20
1	.00	.40		-.10
2	-1.00	-.20	-.10	

TABLE IV-V
 MATRICES OF INDICES OF ASSOCIATION
 Social Science
 History and Philosophy

	I	II	1	2
I		.77	.40	.80
II	.77		-.78	-.39
1	.40	-.78		.09
2	.80	-.39	.09	

TABLE IV-W
 MATRICES OF INDICES OF ASSOCIATION
 Social Science
 Elementary Education

	I	II	1	2
I		.77	1.00	.80
II	.77		.80	.40
1	1.00	.80		.80
2	.80	.40	.80	

TABLE IV-X
MATRICES OF INDICES OF ASSOCIATION
Probability and Statistics
Education

	I	II	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I		.50	1.00	.20	.40	.80	-.40	-.40	.20	.20	-1.00	.20	-.40	.80	.40	.60	-.20
II	.50		.60	-.20	.40	.80	-.40	-.40	-.20	-.20	-.60	-.20	-.40	.00	-.40	1.00	.20
1	1.00	.60		.30	.50	.60	-.20	-.50	.30	.10	-.90	.30	-.30	.70	.30	.60	.00
2	.20	-.20	.30		.90	.10	.30	.60	1.00	.90	-.60	1.00	.70	.70	.70	-.10	.30
3	.40	.40	.50	.90		.30	-.10	.50	.90	.80	-.70	.90	.60	.60	.40	.30	.50
4	.80	.80	.60	.10	.30		-.60	-.30	.10	.30	-.30	.10	.10	.10	.10	.80	.60
5	-.40	-.40	-.20	.30	-.10	-.60		.10	.30	.10	-.10	.30	.00	.50	.70	-.90	-.70
6	-.40	-.40	-.50	.60	.50	-.30	.10		.60	.70	.20	.60	.90	-.10	.10	-.30	.50
7	.20	-.20	-.30	1.00	.90	.10	.30	.60		.90	-.60	1.00	.70	.70	.70	-.10	.30
8	.20	-.20	.10	.90	.80	.30	.10	.70	.90		-.30	.90	.90	.40	.60	.00	.60
9	-1.00	-.60	-.90	-.60	-.70	-.30	-.10	.20	-.60	-.30		-.60	-.10	-.90	-.50	-.30	.10
10	.20	-.20	.30	1.00	.90	.10	.30	.60	1.00	.90	-.60		.70	.70	.70	-.10	.30
11	.40	-.40	-.30	.70	.60	.10	.00	.90	.70	.90	-.10	.70		.00	.90	-.10	.70
12	.80	.00	.70	.70	.60	.10	.50	-.10	.70	.40	-.90	.70	.00		.80	-.10	-.30
13	.40	-.40	.30	.70	.40	.10	.70	.10	.70	.60	-.50	.70	.90	.80		-.40	-.20
14	.60	1.00	.60	-.10	-.30	.80	.90	-.30	-.10	.00	-.30	-.10	-.10	-.10	-.40		-.20
15	-.20	.20	.00	.30	.80	.60	-.70	.50	.30	.60	.10	.30	.70	-.30	-.20	-.30	

80

TABLE IV-Y

MATRICES OF INDICES OF ASSOCIATION
Social Science - Education

	I	II	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I		.70	-.70	.80	.40	-1.00	.80	.40	.80	.40	-.40	.80	.40	.80	.80	-.80	-.60
II	.77		.00	.80	1.00	-.40	-.20	.60	.80	.60	-.40	.80	.60	.80	-.20	.20	.40
1	-.20	.00		.30	.50	.60	-.20	-.50	.30	.10	-.90	.30	-.30	.70	.30	.60	.00
2	.80	.80	.30		.90	.10	.30	.60	1.00	.90	-.60	1.00	.70	.70	.70	-.10	.30
3	.40	1.00	.50	.90		.30	-.10	.50	.90	.80	-.70	.90	.60	.60	.40	.30	.50
4	-1.00	-.40	.60	.10	.30		-.60	-.30	.10	.30	-.30	.10	.10	.10	.10	.80	.60
5	.80	-.20	-.20	.30	-.10	-.60		.10	.30	.10	-.10	.30	.00	.50	.70	-.90	-.70
6	.40	.60	-.50	.60	.50	-.30	.10		.60	.70	.20	.60	.90	-.10	.10	-.30	.50
7	.80	.80	-.30	1.00	.90	.10	.30	.60		.90	-.60	1.00	.70	.70	.70	-.10	.30
8	.40	.60	.10	.90	.80	.30	.10	.70	.90		-.30	.90	.90	.40	.60	.00	.60
9	-.40	-.40	-.90	-.60	-.70	-.30	-.10	.20	-.60	-.30		-.60	-.10	-.90	-.50	-.30	.10
10	.80	.80	.30	1.00	.90	.10	.30	.60	1.00	.90	-.60		.70	.70	.70	-.10	.30
11	.40	.60	-.30	.70	.60	.10	.00	.90	.70	.90	-.10	.70		.00	.90	-.10	.70
12	.80	.80	.70	.70	.60	.10	.50	-.10	.70	.40	-.90	.70	.00		.80	-.10	-.30
13	.80	-.20	.30	.70	.40	.10	.70	.10	.70	.60	-.50	.70	.90	.80		-.40	-.20
14	-.80	.20	.60	-.10	.30	.80	.90	-.30	-.10	.00	-.30	-.10	-.10	-.10	-.40		-.20
15	-.60	.40	.00	.30	.80	.60	-.70	.50	.30	.60	.10	.30	.70	-.30	-.20	-.30	

TABLE IV-Z

MATRICES OF INDICES OF ASSOCIATION
Elementary Education
Education

	I	II	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I		.80	.40	1.00	1.00	.20	.80	.20	1.00	.80	-.80	1.00	-.20	.80	1.00	-.40	.00
II	.80		.20	.80	.80	.40	.40	.40	.80	1.00	-.40	.80	.80	.40	.80	-.20	.60
1	.40	.20		.30	.50	.60	-.20	-.50	.30	.10	-.90	.30	-.30	.70	.30	.60	.00
2	1.00	.80	.30		.90	.10	.30	.60	1.00	.90	-.60	1.00	.70	.70	.70	-.10	.30
3	1.00	.80	.50	.90		.80	-.10	.50	.90	.80	-.70	.90	.60	.60	.40	.30	.50
4	.20	.40	.60	.10	.30		-.60	-.30	.10	.30	-.30	.10	.10	.10	.10	.80	.60
5	.80	.40	-.20	.30	-.10	-.60		.10	.30	.10	-.10	.30	.00	.50	.70	-.90	-.70
6	.20	.40	-.50	.60	.50	-.30	.10		.60	.70	.20	.60	.90	-.10	.10	-.30	.50
7	1.00	.80	-.30	1.00	.90	.10	.30	.60		.90	-.60	1.00	.70	.70	.70	-.10	.30
8	.80	1.00	.10	.90	.80	.30	.10	.70	.90		-.30	.90	.90	.40	.60	.00	.60
9	-.80	-.40	-.90	-.60	-.70	-.30	-.10	.20	-.60	-.30		-.60	-.10	-.90	-.50	-.30	.10
10	1.00	.80	.30	1.00	.90	.10	.30	.60	1.00	.90	-.60		.70	.70	.70	-.10	.30
11	-.20	.80	-.30	.70	.60	.10	.00	.90	.70	.90	-.10	.70		.00	.90	-.10	.70
12	.80	.40	.70	.70	.60	.10	.50	-.10	.70	.40	-.90	.70	.00		.80	-.10	-.30
13	1.00	.80	.30	.70	.40	.10	.70	.10	.70	.60	-.50	.70	.90	.80		-.40	-.20
14	-.40	-.20	.50	-.10	.30	.80	.90	-.30	-.10	.00	-.30	-.10	-.10	-.10	-.40		-.20
15	.00	.60	.00	.30	.50	.60	-.70	.50	.30	.60	.10	.30	.70	-.30	-.20	-.20	

Pattern Conclusions

Table V presents the results of the analysis. If two groups of researchers rated four or more common competencies they were considered possible candidates to form a type. This does not imply that they must form a type, but it is possible that a type is present. The listing of the potential groups was done previously. Following the method of analysis previously described, Table V was constructed. The area listed first was paired with each of the other areas in the various charts. An "x" in the first row of each chart indicates the first area listed has this particular competency in common with all groups that have an "x" in that column. Thus it is possible that the indicated competency may be forming into a broad or general competency. If no "x" is present at the beginning of a column this indicated the competency is specific to area of research indicated. Those competencies may be developed into a broad competency but they will not develop into a general competency. Thus Table V presents the theoretical structure from which to develop the competency patterns. The competencies are labeled in accordance with the first listing presented previously in the Competency Classification Chart.

From the original twenty-one competencies there are seven that form broad area competencies. Table VI indicates these competencies, with an "x" indicating the area possessing

TABLE V
TYPAL DEVELOPMENT

I								
AREA OF RESEARCH	COMPETENCIES POSSESSED							
	a	b	c	d	e	f	g	i
Curriculum		x		x	x	x	x	
Social Science			x	x				x
Physical Science	x			x				
Secondary Educ.					x		x	
Special Education						x	x	
Educ. Research	x		x	x				
History and Phil.		x		x	x		x	
Elementary Educ.							x	
Sociology				x	x	x		
Education	x	x		x			x	
Educ. Psychology	x			x	x		x	
II								
AREA OF RESEARCH	COMPETENCIES POSSESSED							
	a	b	c	d	e	f	g	j m
Counseling & Guid.					x		x	
Curriculum		x				x	x	
Physical Science	x			x				x
History and Phil.		x						x
Elementary Educ.							x	
Education		x		x			x	
Educ. Psychology	x		x	x	x		x	

TABLE V--Continued

III								
AREA OF RESEARCH	COMPETENCIES POSSESSED							
	a	b	c	d	e	f	g	j
Educ. Research			x	x		x		
History and Phil.		x	x					x
Sociology			x	x	x	x		
Educ. Psychology	x		x	x	x	x	x	

IV				
AREA OF RESEARCH	COMPETENCIES POSSESSED			
	a	c	g	e
History and Phil.		x		
Educ. Psychology	x	x	x	x

V					
AREA OF RESEARCH	COMPETENCIES POSSESSED				
	a	b	g	o	n
Prob. and Stat.		x	x		
Measurement		x		x	x
Education	x	x	x		

VI						
AREA OF RESEARCH	COMPETENCIES POSSESSED					
	a	b	c	d	g	j
Social Science			x			
History and Phil.		x	x			x
Elementary Educ.					x	
Education	x	x		x	x	

TABLE V--Continued

VII				
AREA OF RESEARCH	COMPETENCIES POSSESSED			
	a	d	g	h
Elementary Educ.			x	
Education	x	x	x	x

TABLE VI

BROAD AREA COMPETENCIES

AREA OF RESEARCH	COMPETENCIES POSSESSED						
	a	b	c	d	e	f	g
Education	x	x		x			x
Curriculum		x		x	x	x	x
Research	x		x	x		x	
Elementary Education							x
History and Phil.		x	x	x	x		x
Secondary Education							x
Special Education			x		x	x	x
Measurement	x						
Educational Psych.	x		x	x	x	x	x
Prob. and Stat.		x					x
Counseling & Guid.					x		x
Sociology			x	x	x	x	
Social Science	x			x			
Physical Science	x			x			

the competency. The broad area competencies are:

- (a) Statistics
- (b) Communication Skills
- (c) Review of the Literature
- (d) Research Design
- (e) Generalization
- (f) Peer Group Relationships
- (g) Problem Development.

The definitions of these competencies are those given in the original classification of the competencies as shown in Table III.

Typal Exclusions

From the original 18 areas selected for the study, 14 were included in the final analysis. The theory of types makes the assumption that a type possesses the characteristics in common with the member with the fewest characteristics. That is, "Every prospective classification is consummated only if it represents the best possible classification..."¹ A group was classified in this study only if it possessed four or more competencies in common with the others as four was the least number of competencies upon which any group agreed. It should be noted that the above statement from McQuitty does not eliminate the classification, "No". This classification might possibly be the best. Four groups fell into the no classification bracket in this study. These groups were more like themselves than any

¹McQuitty, "Hierarchical Linkage Analysis...", p. 57.

other group; thus they did not form a type with the other groups, and were excluded from the typal analysis.

The exclusion of these groups could possibly be unique to this study. With another sample they may possibly form a type with some group. It may be possible that the division of areas selected for analysis in this study were the divisions that do not lend themselves to formation of types with the excluded groups. It is not to be assumed that the divisions of this study are the smallest possible, neither is it the purpose of this study to analyze typal theory to obtain justification for the exclusion of some groups. The groups excluded were Biological Science, Psychology, Educational Administration, and Humanities.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The main theme of Chapter I was that the literature consistently criticized much research as being poor research, the definition of poor or good research being intuitive with the reader of the criticisms. Several writers were quoted as suggesting certain competencies should be developed by the researcher in specific areas but little research (if any) seemed to be done in the area concerning which competencies should be developed (except as implied by critique of published research). A study by Rutherford was an exception to the previous statement. Of course, specifying the competencies to be developed in training researchers does not guarantee that these competencies will be used. However, a guide of which research competencies are relevant would be helpful in preparing future researchers.

The literature indicated that many training programs were not very well coordinated. This again leads to the problem that in order to coordinate a program it is necessary to know what should be coordinated.

Some research on research has been done by examining the finished product of a researcher or by examining the

college catalogues where particular research programs are offered. This study did not follow these particular orientations but was concerned with the competencies the researcher participant thought were important to him at the present time in his current research activities. This was considered to be a superior orientation to those mentioned previously as competency patterns proposed by the university or by a critique may be limited in scope to a few individuals. This is not to imply that the previous orientations are not informative, but that training for competencies that are actually in use should be considered more important than training for competencies that may or may not be used in a particular area.

The problem that was investigated by this study was two-fold:

1. Were there basic competencies that all educational researchers should possess?
2. Were there competencies which educational researchers should possess unique to their respective fields of research endeavor?

Consideration of Hypotheses

The hypotheses being tested were:

- H₁: There is not a general competency (or competencies) basic to all the tested areas of educational research.
- H₂: There is not a broad competency (or competencies) basic to some (but not all) of the tested areas of educational research.

H₃: There is not a competency (or competencies) unique to each of the tested areas of educational research.

Tables V and VI presented the data used to test these hypotheses. Referring to Table VI, it may be seen that H₁ is not rejected, since no general competency developed. Table VI further indicated that H₂ must be rejected as seven broad competencies were found. Table V indicated that H₃ must be rejected as there were many indicated unique competencies appropriate to the individual research areas.

Conclusions

The excluded groups will be considered briefly as their competencies are more unique than the competencies tested. The "definition" given for competency in this study was anything listed by the researcher on the Competency Ranking Form. Thus a wide range of items could have been listed. However, the researchers in each area agreed on at least four or more competencies which might indicate good reliability for the study. That is, in each area some consistent results are being obtained.

One item that sets the four groups in such a unique position was the more common listing of abstract, theoretical concepts as necessary to do research. One competency that, understandably, was unique to Psychology was the listing of "clinical experience". Usually this competency was among

the top three categories for each of the psychologists sampled. Another competency listed by both psychology and educational administration was creativity. This competency, possibly hard to teach or define, was considered by both groups important to do research.

Biological Science listed two competencies that were unique: Perceptive Observation and Common Sense. The latter competency may be accepted by many researchers, yet it, too, is hard to define (or teach). Another competency listed was patience.

Humanities included competencies such as commitment to the search for knowledge and good health of the researcher, in addition to perseverance in detailed applications.

The conclusion to be reached here was that these particular areas of research consider the more abstract qualities of greater importance than classroom work. These abstract qualities must be developed first, then the more "basic" techniques are to be developed. Of course, the basic techniques were listed in these four groups but not enough agreement was present among them to develop a type.

Referring again to Table VI and Appendix D, it can be shown that the competencies covering the most areas of research are competency "g" (developing the problem), "d" (research design), "e" (generalization), and "c" (review of the literature), in that order. A conclusion drawn was that these competencies may form a basic group in the areas

tested (only measurement did not possess one or more of the competencies in common). Most of the skills that make up these competencies could be taught in the classroom; e.g., library skills for literature review, statistical assumptions necessary for generalization, research design, etc. The development of the problem is possibly the most difficult to teach (if at all possible).

A conclusion drawn from Table V is that the concept of single inclusive general training programs in research is not tenable in terms of the data collected for this study. The development of many specific competencies in the analysis seems to indicate that the basic group of competencies needs to be developed first and then specialization take place in the latter part of a training program. The data indicated that no general competency exists and very few broad competencies are found. This point is again reinforced by the excluded types; indication being that, relative to the areas considered in this study, preparation for research in the excluded areas is specialized indeed.

Discussion of a Proposed Training Program

From the results of this study, it was concluded that not all competencies indicated as necessary to do research may be taught in the classroom. For those who do lend themselves to the classroom structure, the competency pattern to be developed in the classroom should first be the competencies that appeared to be basic to the research

areas investigated:

1. Basic understanding of good research designs. Why are some designs better than others? How can some designs be improved?
2. The development of the literature. Does the literature indicate a need for research of certain problems? Has related research been done? Is enough information available to develop a researchable problem?
3. Indication that a problem exists. Is there actually a problem being discussed by the literature? Can the problem be researched in a way in which meaningful answers can be obtained? How can the problem be defined?
4. Generalization. Is the study capable of being generalized? What conclusions can be reached when the data is interpreted? How can the findings be applied as a solution to the problem?

This competency pattern, which represents a rather general pattern, should be followed with training in specific competencies, according to the areas being discussed. If training is desired in several fields of research, each field history should be consulted (refer to Tables V, VI, and Appendix D). These competencies may require the development of prerequisite skills before the development of the competency even begins.

This discussion seems to follow the lines of training that is already in practice: general instruction followed by specific instruction. However, if the literature is a good indicator of problems in a field of study, many of the specific competencies are not being developed. A degree

in a specific field such as research and statistics should not be a license to do quality research in all areas of endeavor.

It is suggested that beyond the basic competency program the training be planned toward the specific goals of developing the research competencies this study has indicated necessary in each field in which the candidate intends to do research. As such the basic background preparational program should include guided experiences in:

1. literature searching, analysis, and evaluation;
2. the analysis of the various research designs including their differences as well as similarities with respect to their separate constructs;
3. the process for the initiation of the research inquiry as it related first to problem identification and statement and finally to the generalization process of the forming of conclusions.

APPENDICES

APPENDIX A

Dear fellow researcher:

I would like your cooperation on a doctoral research study. The study seeks to answer two questions:

- (1) Are there basic competencies that all educational researchers should possess?
- (2) Are there competencies educational researchers should possess which are unique to their respective fields of research?

It is with your help that these questions can be answered.

On the enclosed form please rank, in order of importance, seven competencies that are important in your area of research. Do not list what you think are ideally important, but list those that you use in your research situation. Please be as specific as possible in your ranking; e.g., do not list "mathematics", but list, possibly, "the first course in statistics". Do not limit your listing to course work but include any competency that is important. This may include "creativity in presenting statistical results" or other competencies that are not taught in the classroom.

A check list of competencies was not included in this study since I am interested in your specific situation. The sample for the study was stratified according to research areas and some strata have as few as two representatives. It is very important that I receive your reply as you may be one of these two representatives. You are representing many others like yourself in the population of educational researchers.

Thank you for your cooperation.

Sincerely,

Ronnie L. Moss
Assistant Director
Statistical Laboratory

RLM:lmr
Enclosures

APPENDIX B

C O M P E T E N C Y R A N K I N G F O R M

DIRECTIONS: Please rank SEVEN competencies that you use in your specific area of research. Rank as number one the competency you use most often. Rank as number seven the competency you use the least (as related to the other seven). Please be as specific as possible.

<u>RANK</u>	<u>COMPETENCY</u>
1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____
7.	_____

A brief resume of the results of this study will be available after August of this year. If you would like a copy, please write your name and address below.

APPENDIX C

Dear fellow researcher:

Possibly you have misunderstood the purpose of the competency ranking form that I sent to you recently. The letter that was enclosed stated that the purpose of the study was to determine competencies that all educational researchers should possess. The word "educational" should be applied in a broad sense: any good research should have some educational value, if only to the researcher. Research that is educational can be done in the physical sciences, natural sciences, industry, in counseling and guidance, etc.

All the names used in the sample for the study were selected from the National Register of Educational Researchers (Phi Delta Kappa, 1965). Since your name was selected it indicates that you do or have done research that is of an educational nature. Thus you and the field that you represent are important to the study.

Possibly you have read some particular research in your field and made the comment, "Even a moron could have done a better job than that!" This statement is part of the basis for the competency ranking form. What was wrong with the researchers' study? What competencies (or abilities) should the researcher know or possess in order not to make serious errors in research?

The ranking form is unstructured because one group of items (or abilities) cannot possibly meet all situations; therefore I am interested in what you think are important abilities or competencies. Your list should apply to your area of interest.

As of the date of this letter, I have not received a reply from you. Since the population was stratified your reply is necessary in order to maintain representatives of the sample. Will you please use the enclosed form for a reply?

I will appreciate your cooperation.

Sincerely,

Ronnie L. Moss
Assistant Director
Statistical Laboratory

RLM:lmr
Enclosure

APPENDIX D

ORIGINAL COMPETENCY AGREEMENTS BY AREAS OF EDUCATIONAL RESEARCH

Competency Area	A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Q	R	S	T	U
Biological Sci.			x	x	x										x	x				*
Counseling	x	x		x	x		x					x								
Curriculum	x	x	x	x	x	x	x													
Education	x	x		x			x	x												
Ed. Administration				x	x		x											x		*
Ed., Elementary	x	x		x			x													
Educ. Psych.	x		x	x	x		x													
Educ. Research	x		x	x	x	x														
Ed., Secondary	x				x	x	x													
Hist. and Phil.	x	x	x	x	x					x										
Humanities	x						x						x						x	*
Measurement	x	x						x					x	x						
Physical Sci.	x	x		x		x						x					x			
Prob. and Stat.	x	x					x	x						x						
Psychology	x	x		x														x		*
Social Studies	x	x	x	x				x	x											
Sociology	x			x	x	x						x								
Special Education		x	x	x		x	x													

*Excluded

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